Oct. 15, 1940. W. MUNZER 2,218,063

MUFFLER

Filed Jan. 14, 1937 2 Sheets-Sheet 1

FIG. 1

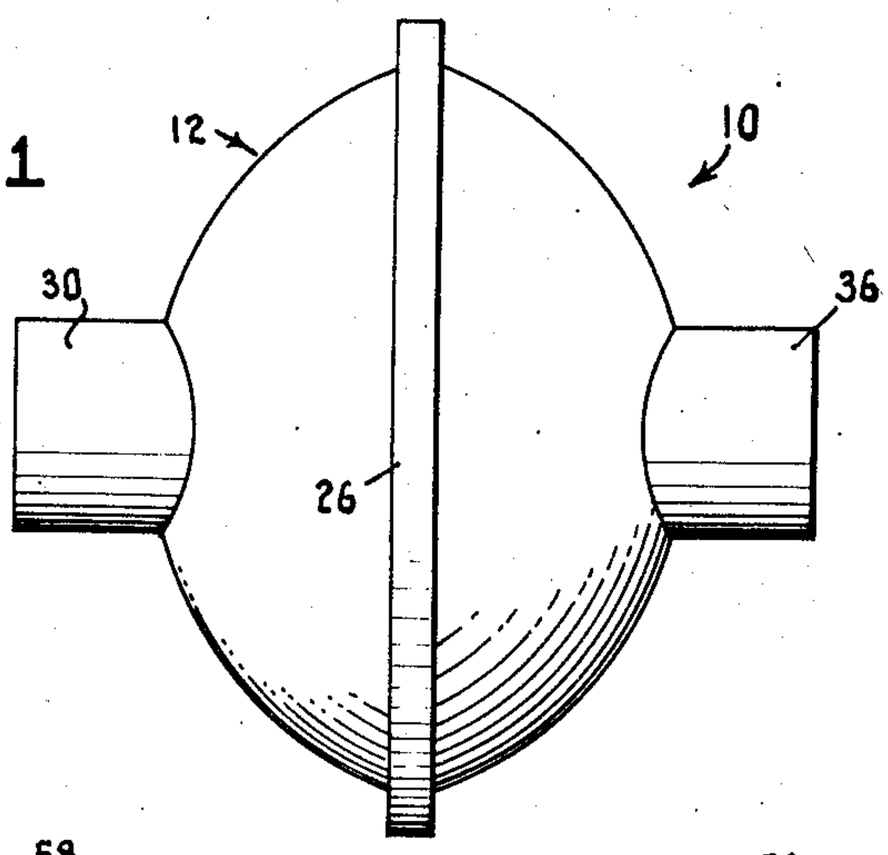

FIG. 2

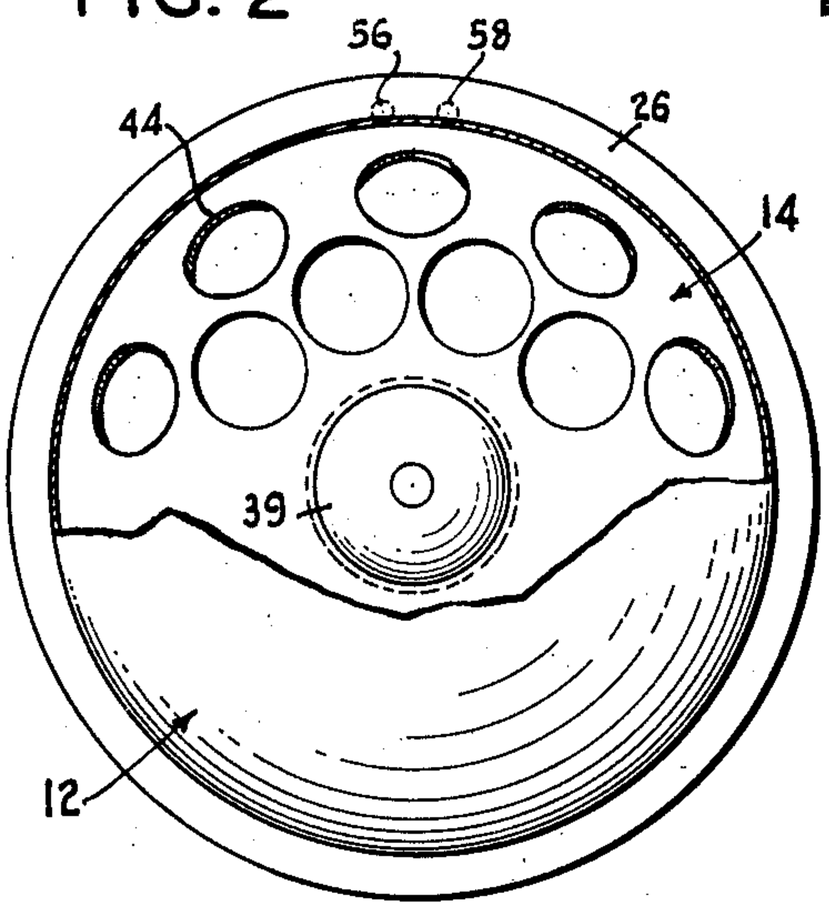

FIG. 3

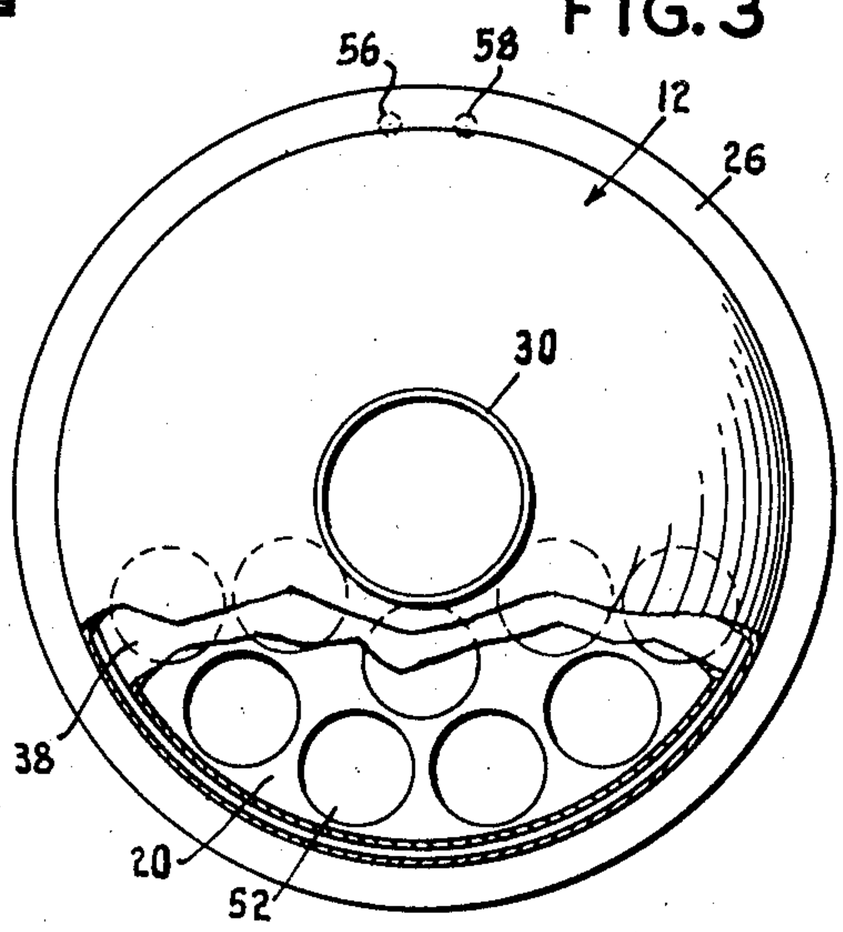

FIG. 5

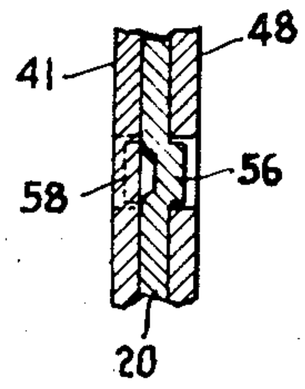

FIG. 6

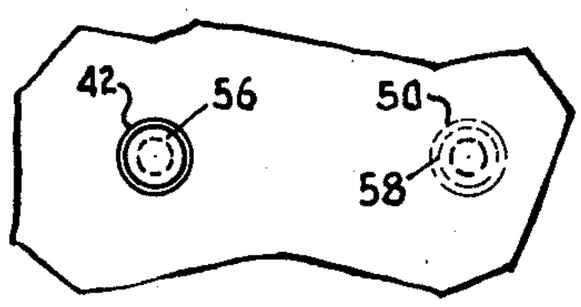

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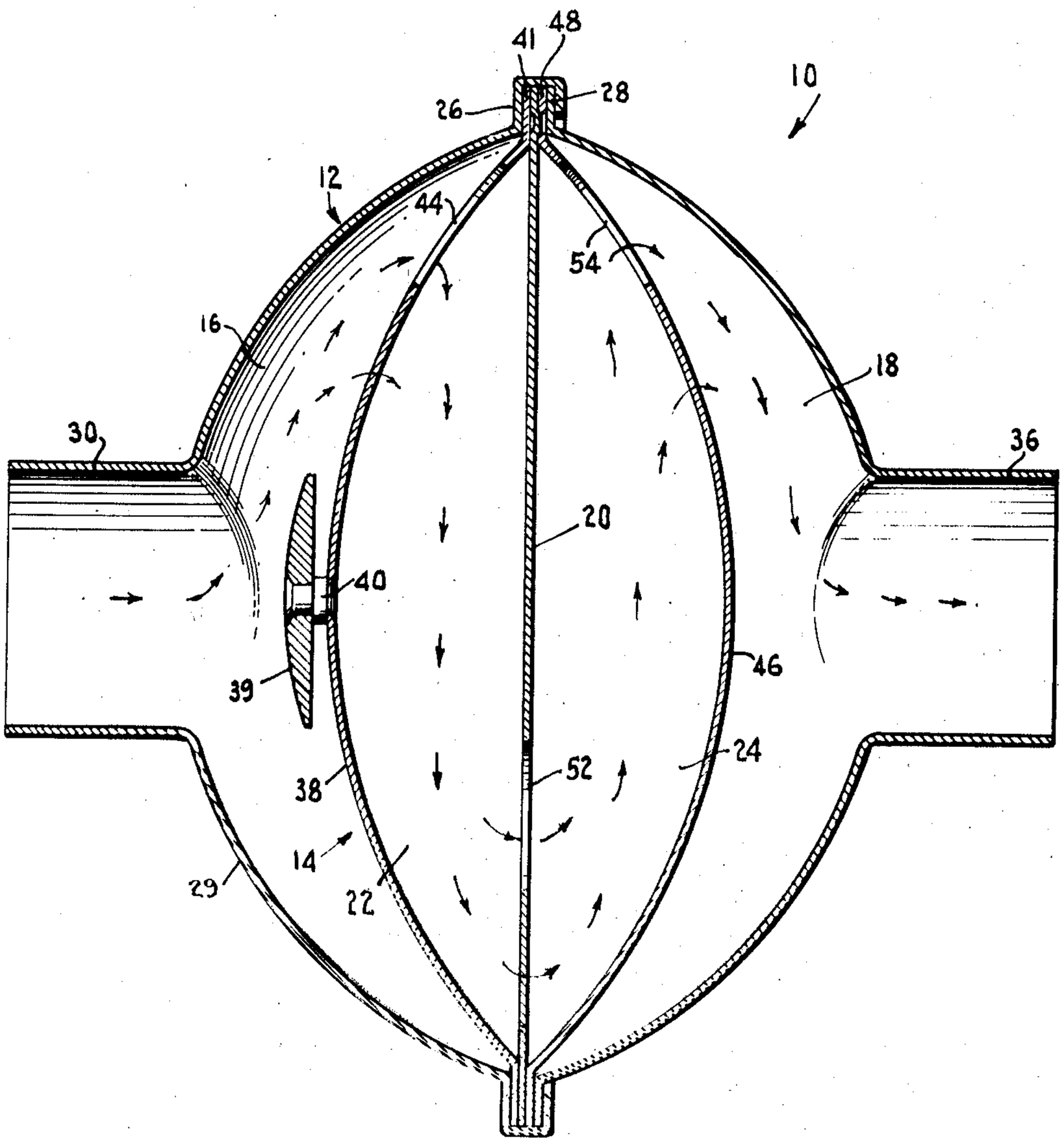
FIG. 4



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UNITED STATES PATENT OFFICE

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MUFFLER

William Munzer, Brooklyn, N. Y.

Application January 14, 1937, Serial No. 120,466

4 Claims. (Cl. 181—57)

This invention relates to mufflers, and more particularly to that type of muffler used in connection with the exhaust gases of internal combustion engines.

In the past mufflers for this use have been constructed to take the expelled gases through long and torturous paths, so that the gases would escape noiselessly, or various baffle arrangements have been used. I have found that in such mufflers the "pocketing" effects in connection with the baffle arrangements frequently render the mufflers almost wholly inoperative as such; in other instances such effects create an undue amount of back pressure which seriously interferes with the proper operation of the engine to which the muffler is connected; and such prior art mufflers are highly inefficient in the cooling of the gases. In other instances, under condition of a "back-fire," the flame can escape past the muffler, rendering its use hazardous. In the attempt to make up for the improper designs of these mufflers, the same were made long, complex, cumbersome and heavy, and occupied much space wherever installed.

By my invention these and other objectionable features are eliminated, and there is obtained a compact, highly efficient muffler, that is of simple construction and cheap in cost of construction, and this is one of the objects of my invention.

It is another object of my invention to provide for a continuous, unimpeded flow of the exhaust gases while at the same time accomplishing the proper purposes of a muffler.

It is still another object of my invention to provide a muffler in which there is a minimum of back pressure developed.

Still another object of my invention is to provide large and inter-communicating chambers into which the hot gases are expanded and cooled.

A further object of my invention is to provide a muffler having a large chamber into which the incoming gases are expanded, a second chamber of larger area communicating with the first chamber, a chamber of at least equal area communicating with the second chamber, and a fourth chamber also of large area and communicating with the third chamber, which latter chamber communicates with the atmosphere, although the number of chambers is optional.

A still further object of my invention is to provide a muffler with large chambers on both the inlet and outlet sides thereof.

An even further object of my invention is to provide a multi-chambered muffler in which the openings between the chambers are as large as or larger than the inlet opening; and also in which the openings between successive chambers are arranged in staggered or offset relation.

Other and additional advantages of my invention will appear as the description proceeds, together with the accompanying drawings, in which

Figure 1 is a side elevation showing one embodiment of my invention;

Fig. 2 is an end view looking from the left-hand or inlet end of the muffler, parts being broken away to show the first intermediate wall;

Fig. 3 is an end view from the same direction as Fig. 2, with other parts broken away to show the construction and arrangement of the center baffle plate;

Fig. 4 is a vertical cross section of my device, and

Figs. 5 and 6 are enlarged fragmentary views of the means locating and locking in place the several parts of my device.

Referring to the drawings, 10 indicates the complete article of manufacture, which in this case is shown as a muffler for use with internal combustion engines.

For the purposes of this application a spheroidal form of muffler is shown, but it is to be understood that this matter of shape is to some extent optional with the manufacturer, as will be apparent from those skilled in the art and from a consideration of the following.

The muffler consists of an outer spheroidal housing 12 and an inner spheroidal housing 14, dividing the housing 12 into inlet chamber 16 and outlet chamber 18, and a baffle plate 20, dividing the inner housing 14 into two chambers 22 and 24.

The two halves of the housing 12 are respectively provided with peripheral flanges 26 and 28, the construction and purpose of which will be hereinafter more fully described in connection with the assembly of the parts. Likewise each of the two halves of the housing have a pipe integral therewith forming respectively inlet pipe 30 and outlet pipe 36. These pipes may be separate and secured to the housing 12 in any of the well known ways, as by welding, as will be understood.

To the side 38 of housing 14, and in line with the exhaust inlet 30, is secured impinging plate 39. This may be secured in any of the well known ways, as by shouldered rivet 40, and may be of whatever material and construction desired to prevent the hot gases under pressure from breaking down the housing 14 opposite the inlet. The

side 38 of the housing has a peripheral flange 41 extending therefrom and corresponding to flanges 26 and 28. Above the horizontal center line and extending adjacent to the flange 41 are a plurality of large diameter perforations 44, the aggregate area of which is shown as approximately two and one-half times the area of the exhaust inlet 30. Baffle plate 20 is a flat disc of a diameter to overlie the flange 41, and below the horizontal center line thereof and extending adjacent to its periphery are a plurality of large perforations 52, the aggregate area of which may also be approximately two and one-half times the exhaust inlet 30, more or less.

Similarly the outlet side 46 of housing 14 has a peripheral flange 48 and a plurality of large perforations 54 of substantially the same aggregate area as perforations 44 and also located above the horizontal center line and extending adjacent to the flange 48.

It will be noted that in each instance the perforations also extend well toward the horizontal center line although succeeding groups of perforations do not overlap. The outlet pipe 36 is of the same area as inlet pipe 30. Adjacent the periphery are protuberances 56 and 58 which fit into holes 42 and 50 of flanges 41 and 48 respectively for locating and keeping in spaced relation side 38 and 46 with baffle plate 20.

In assembling the muffler unit, baffle plate 20, which has been provided near its periphery with locating protuberances 56 and 58, is placed between the flanges 41 and 48 with the protuberances fitting into holes 42 and 50 formed respectively in the flanges. Thus the sides 38 and 46 of the housing and the baffle plate 20 are accurately located and the perforations 44, 52 and 54 are kept in proper spaced relation. While the parts may be secured together in any desired manner, one simple method will be described by way of example. The flange 28 of one of the outer housing halves 12 is the same size as the flanges 41 and 48, while flange 26 is larger. Prior to assembly flange 26 is bent over so that the other flanges nest therein in assembly. After the parts are in place the portion of the flange 26 extending beyond the other flanges is turned over and pressed or crimped in place. This same operation clamps and fastens the parts into a tight joint and a complete unit. Thus it will be seen that the muffler comprises but five stampings or parts all very readily assembled into a compact unit of low manufacturing cost.

The increased efficiency over prior types apparenty is due to the following considerations:

In the operation of the device, the exhaust gases entering chamber 16 through inlet pipe 30 impinge on the dome shaped plate 39, and as they expand into the large chamber are dispersed and directed over the entire semi-spherical chamber 16 where they come in contact with the cooling surfaces 29 and 38. The desire is to empty the muffler as rapidly as possible. Aiding this action is the complete and quick spreading of the gases in chamber 16, and the accelerated passing of the gases through the perforations 44 whose combined areas are about two and one-half times that of the inlet 30. The gases thus pass quickly into the baffle chamber 22 where they are further cooled. Also, the chamber 16 has a large free space into which the exhaust gases under pressure are allowed to escape, and the chamber 22 has a displacement area of volumetric capacity of one and a half times that of chamber 16 so that there is no constricted area impeding the flow of the gases. The gases pass from this chamber 22 through the outlet openings 52, the combined area of which is slightly greater than inlet openings 44.

As the partially cooled gases leave chamber 22 and enter chamber 24, which has the same cubic displacement as chamber 22, it is probable a much more rapid cooling of the gases takes place. As the gases are cooled they are condensed considerably in volume. Nevertheless, the outlet openings 54 from chamber 24 are equal to the openings 44 so that the cooled gases may flow freely into the relatively cold chamber 18, of the same large capacity as chamber 16, from whence they pass to the open air through outlet 36, by this time being practically completely cooled and condensed.

In explanation of the fact that there is no possibility of any pocketing of the gases which interferes with the free flow of the gases through the muffler, it may be pointed out first that there are no constricted openings or areas anywhere in the muffler; second the shape of the chambers is such that all gases are circulated and the chambers are completely emptied continuously; third, most of the gases do not travel in long, closely-confined paths in reverse directions; fourth, the several chambers are large in area and have no interfering baffling, and fifth, the outlet openings from each chamber are of large area and extend near the outer edges of each of the partition walls, as well as extending well down toward the horizontal center line of the muffler. In other words, the gases flow continuously almost unidirectionally from the inlet to the outlet without losing the desirable characteristics of a muffler and, in fact, while increasing the efficiency of the muffler action. The same considerations eliminate the undesirable back-pressure heretofore prevalent in mufflers.

An additional advantage of my invention resides in minimizing or eliminating the fire hazard. There being no possibility of a direct path from inlet to outlet, flame, originating on the inlet side due to "back-firing" of the engine, must pass through the several chambers, where it dies, probably because of improper combustion conditions therein. Any "raw" gasoline finding its way into the muffler will burn only slowly in the large chambers; and the same large chambers permit the free and rapid dispersion of any unfired gases reaching the muffler so that the danger of explosions resulting in bursting the muffler is eliminated.

Furthermore, by having the large openings throughout the muffler, there is no opportunity for the accumulation of carbon and soot to clog up the holes and interfere with the proper action of the muffler throughout its life.

The advantages of the muffler of this construction have been established in actual practice, and on the outlet end of the muffler the same is so cool that the hand can be held upon the same while the engine is in operation.

Reference has been made that the number of the chambers can be varied, and note is made that the muffler could also be operated in the reverse or upside down position to that described above, and that the number, disposition and size of the openings in the partitions may be varied, keeping in mind that these openings should have an area at least as large as the inlet opening.

While I have shown and described the preferred embodiment of my invention, it is not my intention to limit the scope of the invention to such embodiment, as I am fully aware that those skilled

in the art may change the same in various particulars without departing from the spirit of the invention. Such modifications are intended to be covered by the appended claims.

I claim:

1. A muffler for cooling and condensing the exhaust gases of internal combustion engines comprising a casing having an inlet, a large cooling chamber connected thereto, a larger cooling chamber communicating therewith, inlet perforations of large area above the horizontal center line for the passage of hot exhaust gases into the larger chamber, a third large cooling chamber receiving condensed gases, inlet perforations of large area below the horizontal center line for the passage of partly cooled gases into the third chamber, outlet perforations of large area above the horizontal center line for the passage of the cooled and condensed gases from said third chamber, the area of each set of inlet perforations being substantially equal to that of said inlet, a fourth large chamber receiving practically completely cooled and condensed gases, and an outlet connected to the fourth chamber.

2. A muffler comprising an outer housing, an inlet and an outlet connected to said housing, a plurality of large semi-spheroidal enclosed cooling chambers in said housing, an impinging plate in the first of said chambers located opposite said inlet, at least one of the succeeding semi-spheroidal chambers being of larger displacement area than the first chamber, large diameter perforations of greater aggregate area than the inlet and forming the means of communication between succeeding chambers, the perforations into succeeding chambers being displaced with respect to each other, and the outlet in said housing communicating with the last of said chambers.

3. A muffler comprising an outer housing, an inlet and an outlet connected to said housing, a plurality of large semi-spheroidal enclosed cooling chambers in said housing, an impinging plate in the first of said chambers located opposite said inlet, at least one of the succeedng semi-spheroidal chambers being of larger displacement area than the first chamber, large diameter perforations of greater aggregate area than the inlet and forming the means of communication between said chambers, the perforations into succeeding chambers being oppositely disposed with respect to each other, an outlet in said housing and communicating with the last of said chambers, the walls of the semi-spheroidal chamber having laterally extending flanges, means carried by the flanges for locking and keeping the several walls in spaced relation with respect to each other and to the outer housing, and means for clamping together the flanges and the outer housing.

4. A muffler comprising an outer housing on opposite sides of which are an inlet and an outlet respectively, partitions in ths housing and dividing the same into a plurality of chambers, two of which communicate respectively with said inlet and said outlet, a group of perforations arranged in a segment of each of said partitions and extending from adjacent the periphery of each partition inwardly, the group of perforations in one partition being offset from the group of perforations in the next partition but extending adjacent to the plane of the group in the next adjacent partition, and each group of perforations having an aggregate cross-sectional area at least equal to the cross-sectional area of said inlet.

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